SUPERFUND PROGRAM PROPOSED PLAN

Boarhead Farms Site

Bridgeton Township
Bucks County, Pennsylvania

January 1998

EPA Announces Proposed Plan

The United States Environmental Protection Agency Region III (EPA) has identified the Preferred Alternative to address hazardous contamination in **groundwater**, soil, surface water, and sediment at the Boarhead Farms **Superfund** Site (Site) located in Bridgeton Township, Bucks County, Pennsylvania. (Terms in **bold** print are defined in the Glossary.)

This Proposed Plan is based on site-related documents contained in the **Administrative Record** for the Site including the **Remedial Investigation (RI)**, the **Baseline Risk Assessment (BLRA)**, the **Ecological Risk Assessment (ERA)**, and the **Feasibility Study (FS)**. The Administrative Record is at the following locations:

Bucks County Library Center
150 S. Pine Street
Doylestown, PA 18901
Director: Inita Rusis
(215) 348 - 9081
Hours: Mon-Thurs: 9:00 AM-9:00 PM
Friday: 9:00 AM-6:00 PM
Saturday: 9:00 AM-5:00 PM

Anna Butch
Administrative Record Coordinator
U.S. EPA - Region III
841 Chestnut Building
Philadelphia, PA 19107
(215) 566 - 3157
Hours: Mon-Fri 8:30 AM-4:30 PM

EPA's Preferred Alternative includes soil aeration and treatment of **Volatile Organic Compound (VOC)** hot spots; drum excavation and offsite disposal; groundwater extraction, metals precipitation and air stripping; institutional controls and monitoring; and residential water treatment.

EPA and the Commonwealth of Pennsylvania encourage the public to review and comment on the Preferred Alternative, the Proposed Plan, and other documents in the Administrative Record file. The public comment period begins on January 5, 1998 and closes on February 4, 1998. On January 14, 1998 at 7:00 PM, EPA will hold a public meeting to discuss the Proposed Plan at the Palisades High School, 35 Church Hill Rd, Kintnersville, Pennsylvania. Written comments, postmarked no later than February 4, 1998, should be sent to:

James P. Harper (3HW21)
Remedial Project Manager
U.S. Environmental Protection Agency
841 Chestnut Building
Philadelphia, PA 19107
(215) 566-3197

Interested persons are encouraged to submit their comments on the Proposed Plan and the other documents in the Administrative Record to EPA during the public comment period. Although EPA has selected a preferred alternative, no final decision has been made. EPA may modify the Preferred Alternative, select another response action, or develop another alternative if public comment or new information presented warrants such an action. EPA, the lead agency, in consultation with the Pennsylvania Department of Environmental Protection (PADEP), the support agency, will make its final selection of a remedy for the contamination at the Site in a **Record of Decision (ROD).**

This Proposed Plan fulfills the public notification requirements of Sections 113(k)(2)(B), 117(a), and 121(f)(1)(G) of the **Comprehensive Environmental Response, Compensation, and Liability Act** of 1980, as amended (CERCLA) 42 U.S.C. §§ 9613(k)(2)(B), 9617(a), and 9621(f)(1)(G) (also known as "Superfund").

SCOPE AND ROLE OF RESPONSE ACTIONS

The Site has been the subject of three prior and one on-going Superfund removal actions. Based on the determinations made during these removal actions EPA has divided the Site into 14 areas of investigation: 4 pond areas, 8 surface land areas, an unnamed creek, and the groundwater. The Site was the target of widespread illegal dumping of hazardous substances from 1969 until sometime in the late 1970s. Contaminants have been found in the groundwater, in the surface and subsurface soils, and buried in various locations in both metal drums and unconsolidated forms. This Proposed Plan suggests addressing the Site as one operable unit and addressing the contamination on a media specific basis.

The primary objective of the remedy described in this Proposed Plan is to reduce or eliminate the potential for human or ecological exposure to buried wastes, contaminated soil and groundwater at the Site. EPA believes the preferred cleanup alternative outlined in this Proposed Plan will comprehensively address any threat posed by the release of hazardous substances at or from the Site.

SITE BACKGROUND AND HISTORY

The Boarhead Farms Superfund Site consists of approximately 120 acres located on Lonely Cottage Road in Upper Black Eddy, Bridgeton Township, Bucks County, Pennsylvania (Figure

1). Aerial photographs indicate that the property was heavily wooded prior to 1969. In 1969, Manfred DeRewal Sr. (hereafter referred to as "Mr. DeRewal") incorporated Boarhead Corporation (BHC) and DeRewal Chemical Company (DCC). Mr. DeRewal acted as the President of both companies. BHC purchased the Site in 1969 and remains the current legal owner. According to Mr. DeRewal, DCC was a chemical and waste hauling company which established its office at the Boarhead Site. Keystone Excavation Company also leased a portion of the Site for its operations.

Illegal dumping has occurred on the Site since the property was purchased by Mr. DeRewal and BHC. There have been numerous reports and findings of spills, fish kills, and offensive odors emanating from the Site. Some of the reports were investigated by the Bucks County Department of Health (BCDOH), the Pennsylvania State Police, and the Pennsylvania Department of Environmental Resources (PADER), now known as the Pennsylvania Department of Environmental Protection (PADEP). Notes and formal memoranda from these inspections indicate that tank trucks, vats, barrels, and other containers containing hazardous substances were stored at the Site. Inspection reports from the 1970s refer to drum burial, releases of hazardous wastes and the presence of lagoons and other standing liquids. Many of the objects and conditions noted in the county and state inspections were confirmed by aerial photographs of the Site in the 1970s.

During the mid 1970s, PADER was active in working with Mr. DeRewal in attempting to eliminate the wastes being brought to the Site. PADER issued at least one administrative order, and entered into numerous negotiations with Mr. DeRewal and BHC in an attempt to resolve the ongoing waste dumping at the Site. However, after numerous inspections yielded further evidence of hazardous waste disposal and spills, it was apparent that no further effort had been made by Mr. DeRewal or BHC to correct the pollution problem at the Site.

A site inspection (SI) was conducted in May 1984, and a final SI report was issued by EPA on January 20, 1986. A **Hazardous Ranking System (HRS)** report was issued by EPA on September 4, 1987; the HRS score for the Site was 39.9, greater than the 28.5 minimum necessary for inclusion on the **National Priorities List (NPL)**.

Based on information and data collected by PADEP and EPA from 1971 through 1988, EPA proposed to include the Site on the NPL on June 24, 1988, and subsequently placed the Site on the list on March 31, 1989. The Remedial Investigation Report for the Site began on December 5, 1989. It showed that large scale dumping of bulk hazardous wastes and drummed materials as well as burial of hazardous substances had taken place in various locations of the Site.

EPA mobilized on the Site on June 18, 1992 and conducted two Superfund removal actions. These involved locating, excavating and disposing of over 2500 buried drums throughout the Site. The excavated areas were then covered with a layer of clean fill to reduce exposure risk. Removal of the drums greatly reduced the contaminant levels in the subsurface soils throughout the Site. A third removal action was performed by General Ceramics, Inc. (GCI) pursuant to an

Administrative Order by Consent dated December 11, 1992 (EPA Docket no. III-92-66-DC). GCI excavated and removed drums and soils contaminated with radioactive wastes. EPA has determined that all known radioactive waste has been removed from the Site.

A fourth removal action to intercept, collect, and treat contaminated groundwater in an onsite treatment facility and provide nearby residents with home well treatment systems is continuing at this time (Figure 3). The interceptor trench is approximately 1300 feet long and is located downgradient from the high VOC and metal concentration areas. The trench intercepts the shallow groundwater flowing through the Site and pumps it to an onsite treatment facility. The VOCs are then removed and the clean water is discharged to an onsite wetland area. In addition, affected residential wells have been equipped with granular activated carbon (GAC) filters.

The Ecological Risk Assessment was completed in September 1995. A follow-up site specific bioassay study was performed in July 1996. The Baseline Risk Assessment (BLRA) was completed in September 1995. Based on these documents, a Feasibility Study (FS) was prepared in July 1997 describing the remedial action objectives and comparing cleanup alternatives for the Site. The findings of these reports are summarized below.

NATURE AND EXTENT OF CONTAMINATION

Air Quality: Air contamination was not found to be an issue at the Site. No contaminants were found in the air that exceeded the surrounding background levels.

Surface Soil Contamination: The surface soils were sampled on a regularly spaced grid pattern throughout the Site. Contaminants measured at concentrations which pose a risk to human health and the surrounding area are as follows:

- Inorganic contaminants of concern include arsenic, beryllium, cadmium, chromium, copper, and thallium.

- Volatile Organic Compounds (VOCs) were detected in areas associated with former drum burial, and include methyl isobutyl ketone (MIBK), trichloroethene (TCE), xylenes, 1,1,1-trichloroethane (TCA), cis-1,2-dichloroethene (cis-1,2-DCE), ethylbenzene, tetrachlorethene (PCE), benzene, acetone, styrene, and toluene.

- The **Semi-Volatile Organic Compound (SVOC)** bis(2-ethylhexyl)phthalate was detected in various areas throughout the Site.

Subsurface Soil Contamination: Subsurface soil samples were collected to evaluate the nature and extent of contamination around the drum burial areas in the open fields (Areas 1, 5, and 6 on Figure 2) and wetlands. Concentrations were evaluated through fate-and-transport modeling. Distribution of the contaminants does not suggest a continuous area of contamination, but rather suggests the presence of smaller “hot spots.” A summary of the results is given below:

- PRGs (Preliminary Remediation Goals) were exceeded in various combinations for beryllium, cadmium, lead, PCE, benzene, 1,1,1-TCA, bis(2-ethylhexyl)phthalate, toluene, and TCE in most open field areas (Figure 2).

- Concentrations of TCE, benzene, and other VOCs indicate the presence of non-aqueous phase liquids (NAPLs) in the area near the farmhouse (Figure 2). The highest concentrations of cadmium and lead were also found in this area, with concentrations of cadmium exceeding 100 times the PRG, and those of lead yielding twice the PRG.
- The wooded wetland area (Figure 2) was found to contain high levels of PCE, TCE, 1,1,1-TCA, and cadmium.

Surface Water Contamination: Surface water samples were collected from the four onsite ponds, two onsite wetland areas, and the unnamed creek, and were compared with those from an offsite pond, wetland, and creek to determine background concentrations. Human health RBCs (Risk Based Concentrations) were not exceeded in the samples collected from the onsite ponds. RBCs for manganese and chromium were exceeded in Wetland Area 12 (Figure 2), however they pose no risk to human health based on the Site-specific BLRA. Manganese was detected in three culverts that drain Wetland Area 12. Low levels of VOCs were found in the wetland areas downgradient from the former drum burial areas.

Sediment: Sediment samples were collected from the onsite ponds, wetlands, creeks and culverts. The RBCs for arsenic, beryllium, chromium, and nickel were exceeded in the onsite ponds. Elevated levels of 1,1,1-TCA, 1,1-DCA, 1,2-DCE, toluene, vinyl chloride, xylenes, and TCE were also detected. Elevated levels of chromium and low levels of various VOCs were detected in a small portion of the wetlands. Low levels of pesticides were detected in sediment samples from the creeks and culverts.

Groundwater contamination: Groundwater quality was investigated for both the shallow and intermediate groundwater systems. The data indicate that there is little connection between the two. The contamination in the intermediate system is from movement through fracture flow. The deep groundwater system was not sampled due to the relatively unfractured underlying bedrock. A summary of the findings is given below:

- Wells in the shallow groundwater system in the wooded uplands (Figure 2) showed concentrations exceeding the **Maximum Contaminant Levels (MCLs)** for both PCE and TCE.

- Wells in the shallow groundwater system in the wooded wetlands (Figure 2) exceeded MCLs for chromium, TCE, and nickel. Low levels of VOCs were also detected.

- Seventeen contaminants were found in the shallow groundwater system in Area 1 (Figure 2) including chromium, lead, nickel, thallium, 1,1,1-TCA, 1,1,2-TCA, 1,1-DCE, 1,2-dichlorobenzene, 1,2-DCA, 1,2-DCE, 1,2-DCP, benzene, cis-1,2-DCE, PCE, trans-1,2-DCE, TCE, and vinyl chloride. The most contaminated well in Area 1 is near the area where **DNAPL (Dense nonaqueous phase liquid**) TCE has been detected.

- Twelve contaminants were detected and exceeded the MCLs in the shallow groundwater system in the area of the farmhouse (Area 2, Figure 2). These included antimony, cadmium, chromium, lead, manganese, nickel, thallium, 1,2-DCA, 1,2-DCP, benzene, cis-1,2-DCE, and vinyl chloride.

- Twenty two contaminants exceeded MCLs in open field areas (Areas 5 and 6, Figure 2). These included beryllium, cadmium, chromium, lead, manganese, nickel, bch-alpha, bch-gamma, nitrobenzene, 1,1,1-TCA, 1,1,2-TCA, 1,1-DCE, 1,2-DCA, MIBK, benzene, carbon tetrachloride, cis-1,2-DCE, ethylbenzene, methylene chloride, PCE, TCE, and vinyl chloride. The levels detected coincide with the highly contaminated subsurface soils located in these areas.

- Chromium, nickel, carbon disulfide, cis-1,2-DCE, lead, 1,1,2-TCA, TCE, 1,1-DCE, and PCE were detected in the intermediate groundwater system in various areas of the Site.

- Twenty two residential wells in the Site vicinity exceeded MCLs for at least one contaminant. Bis(2-ethylhexyl)phthalate was the organic compound detected most often. The inorganic compounds that were detected included: antimony, chromium, thallium, nickel, cadmium, and lead.

Hot Spots: Three areas of particular concern, where NAPLs (Non-Aqueous Phase Liquids) are suspected have been identified. A summary of each area follows:

- Hot Spot 1 is an area where excavation of contaminated drums occurred during the removal activities. High levels of PCE, TCE, 1,1,1-TCA were detected in the soil following drum removal. VOCs were also detected with concentrations increasing with depth. Groundwater from the area showed high levels of TCE, 1,1,1-TCA, cis-1,2-DCE, 1,2-DCA, and vinyl chloride.

- Hot Spot 2, located to the south of the farmhouse, yielded high levels of benzene in soil samples, increasing with depth. Benzene was also found in the groundwater with concentrations up to 300,000 µg/L (micrograms per liter).

- Hot Spot 3 is located northwest of the farmhouse and showed high concentrations of TCE, 1,1,1-TCA, cis-1,2-DCE, and PCE in the soil.

Buried Drums: In 1992 and 1993 more than 2500 drums were excavated from the open field areas (Areas 5 and 6, Figure 2). After these removal actions, a magnetometer survey was conducted and remaining subsurface anomalies were identified. The survey yielded evidence of remaining crushed, empty, and/or intact drums.

Although contamination has been found throughout the Site, the previous removal actions have significantly reduced the contaminant levels. Excavation and disposal of the majority of the buried drums reduced the amount of contaminants leaching into the soil and groundwater. The interceptor trench and onsite treatment facility also remove a significant amount of contaminants from the groundwater. Clean fill placed over the drum removal excavation areas has provided protection from any direct contact risk to humans.

SUMMARY OF SITE RISKS

Following the Remedial Investigation, EPA conducted an analysis to evaluate the human health and environmental hazards that could result if no remedial action were taken at the Site. These analyses are commonly referred to as Risk Assessments and identify existing and future risks that could occur if conditions at the Site do not change. The Baseline Human Health Risk Assessment (BLRA) evaluated human health risks and the Ecological Risk Assessment (ERA) evaluated environmental impacts from the Site.

Baseline Human Health Risk Assessment: The BLRA assesses the toxicity, or degree of hazard, posed by contaminants at the Site, and describes the routes by which humans could come into contact with these contaminants. Separate calculations are made for those substances that can cause cancer (carcinogenic) and for those that can cause non-carcinogenic, yet still adverse health effects.

The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) established acceptable levels of carcinogenic risk for Superfund sites ranging from one excess cancer case per 10,000 people exposed, to one excess cancer case per one million people exposed. This translates to a risk range of between one in 10,000 and one in one million additional human cancer cases. Expressed as scientific notation, this risk range is between 1.0E-04 and 1.0E-06. Remedial action is warranted at a site when the calculated cancer risk level exceeds 1.0E-04. However, since EPA's cleanup goal is generally to reduce the risk to 1.0E-06 or less, EPA also may take action where the risk is within the range between 1.0E-04 and 1.0E-06.

The NCP also states that sites should not pose a health threat due to a non-carcinogenic, but otherwise hazardous condition. EPA defines a non-carcinogenic threat by the ratio of the contaminant concentration at the Site that a person may encounter to the established safe concentration. If the ratio, call the **Hazard Index (HI)**, exceeds one (1.0), there may be concern for the potential non-carcinogenic health effects associated with exposure to the contaminants at the Site. The HI identifies the potential for the most sensitive individuals to be adversely affected

by the noncarcinogenic effects of chemicals. As a rule, the greater the value of the HI above 1.0, the greater the level of concern.

Based on the results of the Remedial Investigation the estimated risks for current use exceed the acceptable limits for groundwater exposure and recreational use of the surficial waters both onsite and offsite. Contamination of the shallow groundwater by VOCs (primarily PCE, TCE, 1,1-DCE, vinyl chloride, benzene, and toluene) and metals (arsenic, chromium, and manganese) contribute to the most unacceptable levels of risk.

Human health risks to residences downgradient of the Site were evaluated for the pathways of ingestion, dermal contact, and inhalation. Risks in the 17 of the 26 residential wells evaluated yielded hazard indices greater than one or carcinogenic risks greater than 100 in a million. These risks are currently being addressed with the installation and maintenance of carbon filters in each affected residence.

The following groups of individuals could be exposed to Site contaminants either at the present time or in the future and were evaluated in the BLRA:

- onsite residents consuming groundwater from residential wells
- offsite residents consuming groundwater from the Site
- onsite workers consuming groundwater from the Site
- recreational onsite users in wetland areas
- recreational offsite users consuming fish from the culvert or creek

Individuals could potentially be exposed to Site contaminants in various ways. The exposure routes evaluated in the BLRA include:

- drinking, breathing while showering, and direct skin contact with groundwater and surface water
- placing objects such as hands contaminated with Site soil and sediment in the mouth
- eating fish from the onsite ponds or offsite culvert and creek

The previous removal actions have reduced the risk of exposure. The continuous treatment of groundwater in the onsite treatment facility has further reduced the risk to offsite residents and onsite workers consuming groundwater from the Site. The removal actions have also reduced the risk to recreational users of the wetlands, culverts, and creeks. The removal of contaminated drums and associated soils, along with the clean fill placed on those areas, has eliminated the direct contact risk onsite.

Different combinations of the above routes of exposure were considered for various groups of individuals that could be exposed to Site contaminants. Table 1 below summarizes the total risk levels from all appropriate exposure routes calculated for each group of individuals.

Table 1
Human Health Risks at the Boarhead Farms Site

Group of Individuals	Maximum Cancer Risk	Maximum Hazard Index
Onsite residents consuming groundwater from onsite residential well	1.3E-03	52
Onsite residents consuming most contaminated groundwater onsite	3.5E-01	17,000
Onsite residents on public water supply	4.1E-05	0.24
Offsite residents consuming groundwater downgradient from Site	5.0E-04	7.6
Onsite workers consuming most contaminated groundwater onsite	3.3E-02	1,800
Onsite workers on public water supply	4.3E-06	0.00056
Recreational Site users-wooded upland areas	8.40E-09	0.0083
Recreational Site users-wetlands	1.4E-06	2.0
Recreational Site users-ponds	3.5E-06	0.14
Recreational Site users-pond fish ingestion	NA	0.059
Recreational offsite users-culvert and creek	1.3E-06	0.032
Recreational offsite users-culvert and creek fish ingestion	5.8E-05	2.3

Actual or threatened releases of hazardous substances from this Site, if not addressed by EPA's preferred alternative or one of the other cleanup alternatives considered, may present a current or potential threat to public health, welfare, or the environment.

Ecological Risk Assessment: Ecological conditions at the Site were characterized by performing field investigations. Data was collected and analyzed and then compared with published data and reports. The evaluated resources associated with the Site include wetlands, vegetation, wildlife, and wildlife habitat. Concentrations of contaminants in the surface water do not pose a significant threat. Bioassay tests were performed for surface soil and sediments and indicate that the presence of contaminants at the Site do not pose a threat to the ecological resources.

SUMMARY OF ALTERNATIVES

The Feasibility Study discusses the full range of alternatives evaluated for the Site and provides supporting information relating to the alternatives in this Proposed Plan. This Proposed Plan discusses a "No Action" alternative as required by the NCP and five other alternatives that are determined by EPA to be protective of human health and the environment, achieve state and federal regulatory requirements, and best achieve the cleanup goals for the Site. These alternatives are derived from those presented in the Feasibility Study. Reviewers are encouraged to comment on the additional alternatives presented in the Feasibility Study as well as those included in this Proposed Plan.

Alternative 1: No Action

Capital Cost	$0
Total Present Worth Cost	$940,000
Operation & Maintenance (O&M)(30 yr)	$60,900/yr

The NCP requires that EPA consider a "No Action" alternative for every Superfund Site to establish a baseline or reference point against which each of the remedial action alternatives are compared. In the event that the other identified alternatives do not offer substantial benefits in the reduction of toxicity, mobility, or volume of the constituents of concern, the No Action alternative may be considered a feasible approach. This alternative leaves the Site in the current condition and all current and potential future risks would remain. The cost for the “No Action” alternative is required to maintain the existing interceptor trench and groundwater treatment facility.

Alternative 2: Institutional Controls, Monitoring, and Residential Water Treatment

Capital Cost	$960,000
Total Present Worth Cost	$3,000,000
Operation & Maintenance (O&M)(30 yr)	$130,000

Institutional controls would be implemented to restrict land and groundwater use at the Site in order to reduce the potential for human exposure to contamination. Fencing and deed restrictions would be required to eliminate the possibility of future residential development and/or use of groundwater at the Site. Land use controls may also be implemented. Techniques available to

limit access to contaminated groundwater include deed restrictions preventing access to the land overlying the contaminated groundwater and legislating a groundwater-use restriction on the property overlying the contamination. In addition, surface grading would be added to promote surface runoff. Since contaminated media would be left onsite, a review of Site conditions would be required every five years. Each review would involve site sampling, inspections, data evaluation and a summary report.

Alternative 3: Soil Excavation, Multilayer Cap; Excavation and Offsite Disposal of Buried Drums; Groundwater Extraction, Metals Precipitation, and Air Stripping; Institutional Controls and Monitoring; and Residential Water Treatment

Capital Cost	$5,200,000
Total Present Worth Cost	$11,690,000
Operation & Maintenance (O&M)(30 yr)	$420,000

This alternative combines excavating contaminated soil and buried drums with offsite disposal and capping of the contaminated central area (Areas 5 and 6). The contaminated soil would be moved from outlying areas to the central area where a geomembrane cap would be constructed, surrounded by perimeter fencing. In addition, 21 extraction wells would be installed to transfer groundwater to the existing onsite treatment facility. The groundwater treatment facility would be augmented to accommodate the larger volume of treatable groundwater by adding a vapor-phase carbon unit for off-gas treatment as well as a metals precipitation unit. Institutional controls as listed in Alternative 2 would also apply, as well as an annual O&M program to maintain the groundwater treatment system.

Alternative 4: Soil Excavation and Stabilization/Solidification; Excavation and Offsite Disposal of Buried Drums; Groundwater Extraction, Metals Precipitation, and UV Oxidation; Institutional Controls and Monitoring; and Residential Water Treatment

Capital Cost	$10,770,000
Total Present Worth Cost	$21,580,000
Operation & Maintenance (O&M)(30 yr)	$700,000

This alternative combines stabilization/solidification of contaminated soils, offsite disposal of buried drums, groundwater extraction, metals precipitation, and UV Oxidation with the institutional controls and monitoring and residential water treatment described in Alternative 2.

The contaminated soils from the outlying areas would be excavated, stabilized and moved to the central area. The central area would also be stabilized and solidified down to the top of the bedrock. Clean soil would be used to cover the stabilized soil as well as for backfilling the excavated areas. The existing groundwater treatment facility would be modified by replacing the

current air stripper with a UV oxidation unit and adding a metals precipitation unit. The remaining buried drums would be excavated and disposed of offsite and extraction wells would be installed for further groundwater treatment.

Alternative 5: Excavation of Soil and Placement in Onsite Landfill; Excavation and Offsite Disposal of Buried Drums; Groundwater Extraction, Metals Precipitation, and Air Stripping; Institutional Controls and Monitoring; and Residential Water Treatment

Capital Cost	$6,890,000
Total Present Worth Cost	$13,090,000
Operation & Maintenance (O&M)(30 yr)	$400,000

This alternative combines the construction of an onsite landfill with the drum excavation and offsite disposal, groundwater extraction, metals precipitation, air stripping, institutional controls and monitoring, and residential well treatment described in the above alternatives.

The landfill would be a RCRA Subtitle C landfill positioned in the central area. Outlying contaminated soils as well as the soils in the central area would be excavated and placed into the landfill. The landfill would be capped with a RCRA cap, a security fence would be installed and an O&M procedure would be implemented. The leachate from the landfill would be directed to the existing onsite treatment plant.

Alternative 6: Soil Aeration and Treatment of VOC Hot Spots; Excavation and Offsite Disposal of Buried Drums; Groundwater Extraction, Metals Precipitation, and Air Stripping; Institutional Controls and Monitoring; and Residential Water Treatment

Capital Cost	$7,180,100
Total Present Worth Cost	$13,157,000
Operation & Maintenance (O&M)(30 yr)	$463,900

This alternative uses aeration of soil hot spots contaminated with high concentrations of VOCs in combination with the offsite disposal of buried drums, groundwater extraction, metals precipitation, air stripping, institutional controls and monitoring, and residential water treatment as described in the above alternatives.

The soils from the hot spot areas containing high levels of VOCs (primarily TCE and benzene) would be collected and mechanically aerated to remove the VOC contaminants in a temporary containment building constructed onsite. The building would be equipped with dust and carbon filtration units for air treatment. The water that refills the excavated TCE area would be pumped to the existing treatment system or air sparged. The clean soils would be used as fill for the excavated areas or placed elsewhere onsite.

COMPARATIVE EVALUATION OF ALTERNATIVES

Each of the six (6) remedial alternatives summarized in this Proposed Plan has been evaluated with respect to the nine (9) evaluation criteria set forth in the NCP, 40 C.F.R. Section 300.430(e)(9). These nine criteria can be categorized into three groups: threshold criteria, primary balancing criteria, and modifying criteria. A description of the evaluation criteria is presented below:

Threshold Criteria:

1. *Overall Protection of Human Health and the Environment* addresses whether a remedy provides adequate protection, both short-term and long-term, and describes how risks are eliminated, reduced, or controlled.
2. *Compliance with* ***Applicable or Relevant and Appropriate Requirements*** **(ARARs)** addresses whether a remedy will meet all of the applicable, or relevant and appropriate requirements of federal environmental laws, as well as state environmental or facility siting laws.

Primary Balancing Criteria:

3. *Long-term Effectiveness and Permanence* refers to the ability of a remedy to maintain reliable protection of human health and the environment over time once cleanup goals are achieved. In addition, it examines the degree of certainty that the alternative will prove successful.
4. *Reduction of Toxicity, Mobility, or Volume through Treatment* addresses the degree to which an alternative employs recycling or treatment that reduces toxicity, mobility, or volume of contaminants.
5. *Short-term Effectiveness* addresses the period of time needed to achieve protection and any adverse impacts on human health and environment that may be posed during the construction and implementation of the alternative.
6. *Implementability* addresses the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement a particular alternative.
7. *Cost* refers to an evaluation of the types of costs that will be incurred with respect to a particular alternative. The following are estimated: capital costs including direct and indirect costs, annual operation and maintenance costs, and net present value of capital and O&M costs.

Modifying Criteria:

8. *State Acceptance* indicates whether, based on its review of backup documents and the Proposed Plan, the State concurs with, opposes, or has no comment on the preferred alternative.
9. *Community Acceptance* will be assessed in the Record of Decision following a review of public comments received on the Proposed Plan and supporting documents included in the Administrative Record.

1. Overall Protection of Human Health and the Environment

A primary requirement of CERCLA is that the selected remedial alternative be protective of human health and the environment. A remedy is protective if it reduces current and potential risks to acceptable levels under the established risk range posed by each exposure pathway at the Site.

The No Action alternative (Alternative 1) would not effectively protect human health and the environment. Although VOCs in the groundwater are treated, system capacity is likely inadequate, air emissions are generated, inorganics are not reduced, and contaminants will migrate offsite. Alternative 2 is similar to the No Action alternative, except MCLs for the residential water supply are met.

Alternatives 3, 4, 5, and 6 are all protective of human health and the environment. All four alternatives provide for an upgrade of the existing groundwater treatment facility with the addition of a metals precipitation unit and methods for further treatment of VOCs. Each of the four alternatives also reduces the risk of exposure. Under Alternative 3 the wastes remain on site, but installation of the cap will minimize infiltration and leaching through the contaminated soil above the groundwater table. Under Alternative 4, soil stabilization and solidification would occur, preventing further leaching altogether. Alternative 5 would protect human health and the environment through containing the contaminated soils and hot spots in an onsite landfill. The landfill would minimize infiltration and leaching, as well as restrict access to contaminated soils. Alternative 6 is protective through largely eliminating organic contaminants from the hot spot areas, in turn reducing the possibility of the organics leaching into the groundwater. With the inclusion of institutional controls, monitoring, and continued excavation and removal of buried drums, each of the Alternatives 3, 4, 5, and 6 would reduce the possibility of further exposure to contaminated soils, further consumption of contaminated groundwater, and further ingestion of contaminated fish from the culverts and creeks.

2. Compliance with Applicable or Relevant and Appropriate Requirements (ARARS)[1]

Any cleanup alternative considered by EPA must comply with all applicable or relevant and appropriate federal and state environmental requirements. *Applicable* requirements are those

[1] Under Section 121(d) of CERCLA, 42 U.S.C. § 9621 (d), and EPA guidance, remedial actions at CERCLA sites must attain legally applicable or relevant and appropriate federal and promulgated state environmental standards, requirements, criteria and limitations which are collectively referred to as "ARARs," unless such ARARs are waived under Section 121(d)(4) of CERCLA, 42 U.S.C. § 9621(d)(4).

substantive environmental standards, requirements, criteria, or limitations promulgated under federal or state law that are legally applicable to the remedial action to be implemented at the Site. *Relevant and appropriate* requirements, while not being directly applicable, address problems or situations sufficiently similar to those encountered at the Site that their use is well-suited to the particular site.

Chemical-Specific ARARs

Alternatives 3, 4, 5, and 6 would satisfy treatment effluent discharge requirements and air emission limits for organic and inorganic pollutants. These alternatives would also meet MCL levels at residential wells. Alternatives 1 and 2 would not meet these requirements.

Action-Specific ARARs

Capping and landfilling in Alternatives 3 and 5 trigger the substantive requirements of the Resource Conservation and Recovery Act (RCRA) treatment, storage and disposal (TSD) ARARS, such as design, operating, closure, and post closure of a RCRA landfill, since contaminants would remain in place.

Alternatives 3, 4, 5, and 6 (to a lesser extent) may disturb wetlands. If wetlands are disturbed, restoration measures will be performed.

Offsite disposal of contaminated soils in Alternatives 3 and 4 trigger RCRA hazardous waste ARARs during excavation activities. These requirements include storage time limits, manifesting, and transporting requirements. In addition, Alternatives 3 and 5 may require that the Site be designated a corrective action management unit (CAMU) to avoid invoking RCRA's land disposal restrictions (LDRs).

During the 30 year remedial period, treatment of inorganics in onsite groundwater (Alternatives 3 through 6) and treatment of off-gas (Alternatives 3, 5, and 6) will require offsite disposal, proper manifesting, and tracking to ensure that waste arrives at a permitted facility.

Location-Specific ARARs

Alternatives 3, 4, and 5 require earthmoving activities within culturally sensitive areas onsite. These areas include those around the farmhouse and onsite ponds. Alternative 2 may also trigger similar ARARs depending on the extent of surface control activities.

3. Long-Term Effectiveness and Permanence

Magnitude of Residual Risk

Alternatives 1 and 2 would provide no additional measures to control residual contaminants, however, Alternative 2 would reduce the risk to exposure. Alternatives 4 and 5 would provide more expedient control of residual risk since the soil contamination would be immediately

stabilized or encapsulated to minimize leaching. Alternative 3, which provides a cap over the central area, would allow contaminants underneath the cap to desorb into the groundwater and leave residual contamination in the soil above the water table. Alternative 6 would reduce residual risk in the hot spot areas since the soil would be removed and treated, thus minimizing leaching.

Adequacy and Reliability of Controls

Alternative 3, 4, 5, and 6 offer equally reliable groundwater treatment processes capable of removing contaminants in the influent stream. For contaminated soils, Alternative 3 is reliable only for minimizing surface water infiltration and resulting contaminant desorption. Alternatives 4 and 5, using soil solidification/stabilization and landfilling are the most reliable since they prevent leaching effects and provide groundwater protection. Alternative 6, soil aeration, is reliable although it is only provided for at hot spots. Alternatives 3, 4, and 5 provide for perimeter extraction wells, reliable for controlling contaminant migration offsite.

4. Reduction of Toxicity, Mobility, or Volume through Treatment

Section 121(b) of CERCLA, 42 U.S.C. Section 9621(b), establishes a preference for remedial actions which include treatment that permanently and significantly reduces the toxicity, mobility, or volume of contaminants. Alternative 1 would provide for some reduction in toxicity, mobility, and volume through organic pollutants being treated in the current groundwater treatment facility. Alternative 2 would not affect volume of onsite contamination, but would reduce toxicity if the existing onsite treatment facility is maintained properly. Surface controls may control mobility in the short term.

Toxicity, mobility, and volume reduction is not achieved by capping in Alternative 3 since the contaminants in the soil would not be fully isolated. The contaminants would still leach into the groundwater over time until reaching the trench system or extractions wells. The volume of potential hazardous wastes excavated during the remedial action and annual O&M for this alternative is higher compared to that of Alternatives 4 and 5.

The onsite landfill in Alternative 5 would not require transport of hazardous wastes offsite during excavation activities, however, offsite transport would be required during O&M. Alternative 4 generates less waste through organic treatment than Alternatives 3, 5, and 6 since GAC is not used in the treatment system. Alternative 6 would reduce the volume and toxicity of organic contaminants in select hot spots only.

5. Short-Term Effectiveness

Alternative 2 would be effective for protection from immediate exposure via contact with surface soil. Alternatives 3, 4, 5, and 6 are equally effective in the short-term. Alternatives 3, 5, and 6 have the greatest risk of exposure during construction since contaminated soil is excavated. Alternative 4 includes both *in situ* and *ex situ* solidification/stabilization so only a fraction of the soil requires excavation.

6. Implementability

All treatment processes described are technically implementable. Alternatives 3, 4, 5, and 6 require treatability studies and specialty contractors for items such as capping, stabilization, and soil aeration. All alternatives require five year site reviews.

Since UV oxidation in Alternative 4 does not generate air emissions, implementation of carbon filter units and associated maintenance is not required. Alternative 4 requires more effort to implement due to the volume of soil that is excavated, treated chemically, and relocated. Design, construction, and operation of the landfill (Alternative 5) requires a high level of effort to implement and needs long-term O&M.

7. Cost

Evaluation of costs of each alternative generally includes the calculation of direct and indirect capital costs and the annual operation and maintenance (O&M) costs, both calculated on a present worth basis. The total present worth cost of all Alternatives has been calculated for comparative purposes and is presented in Table 2.

Table 2
Estimated Cost of Alternatives

Alternative	Total Present Worth Cost
1	$940,000
2	$3,000,000
3	$11,690,000
4	$21,580,000
5	$13,090,000
6	$13,157,000

Direct capital costs include costs of construction, equipment, building and services, and waste disposal. Indirect capital costs include engineering expenses, start-up and shutdown, and contingency allowances. Annual O&M costs include labor and material; chemicals, energy, and fuel; administrative costs and purchased services; monitoring costs; cost for periodic site review (every five years); and insurance, taxes, and license costs. For cost estimation purposes, a period of 30 years has been used for O&M. In reality, maintenance of a multilayer cap on a landfill would be expected to continue beyond this period. Similarly, the actual duration of operation for the groundwater extraction and treatment system would depend on the ability to successfully limit

off-site migration of Site-related contaminants. The actual cost for each alternative is expected to be in a range from 50 percent (50%) higher than the costs estimated to 25 percent (25%) lower than the costs estimated. The evaluation was based on the FS cost estimates as modified by EPA.

8. State Acceptance

The Commonwealth of Pennsylvania is currently reviewing this Proposed Plan. PADEP has reviewed the supporting documents and provided support to EPA throughout the Superfund process at this Site.

9. Community Acceptance

Community acceptance of the preferred alternative will be evaluated after the public comment period on the Proposed Plan ends, and will be discussed in the "Responsiveness Summary" of the Record of Decision for the Site.

PREFERRED REMEDIAL ALTERNATIVE

Based on the comparison of the nine evaluation criteria for each of the alternatives in this Proposed Plan, EPA's preferred alternative is ***Alternative 6: Soil Aeration and Treatment of VOC Hot Spots; Excavation and Offsite Disposal of Buried Drums; Groundwater Extraction, Metals Precipitation, and Air Stripping; Institutional Controls and Monitoring; and Residential Water Treatment***. Alternative 6 meets the threshold criteria of overall protection of human health and the environment and compliance with ARARs. In considering the balancing criteria, EPA believes Alternative 6 can be readily implemented, achieves long-term effectiveness at a reasonable cost, minimizes the short-term impacts, and effectively reduces the toxicity, mobility, and volume of Site contaminants through both engineering controls and treatment.

THE ROLE OF COMMUNITY IN THE SELECTION PROCESS

This Proposed Plan is being distributed to solicit public comment on the appropriate cleanup action for the Site. EPA relies on public input so that the remedy selected for each Superfund Site meets the needs and concerns of the local community. EPA is providing a 30-day public comment period beginning on January 5, 1998 and ending on February 4, 1998 to encourage public participation in the selection process. EPA will conduct a public meeting during the comment period in order to present the Proposed Plan and supporting information, answer questions, and accept both oral and written comments from the public. The public meeting will be held on January 14, 1998 at 7:00 PM at the Palisades High School, 35 Church Hill Rd, Kintnersville, Pennsylvania. EPA will summarize and respond to comments received at the public meeting and written comments post-marked by February 4, 1998 in the Responsiveness Summary section of the Record of Decision, which documents EPA's final selection for cleanup at the Site. To obtain additional information relating to this Proposed Plan, please contact either of the following EPA representatives:

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GLOSSARY

Administrative Record: An official compilation of documents, data, reports, and other information that was considered or relied upon in an Agency's decision making process. In the case of a Superfund site, the Administrative Record is developed to support the Agency's selection of a final remedy for the site. The record is maintained at EPA's offices and placed in the information repository to allow public access to the material.

Applicable, Relevant, and Appropriate Requirements (ARARs): Applicable requirements are those clean-up standards under Federal or State law that specifically address a hazardous substance, pollutant, remedial action, or other circumstance at a CERCLA site. Relevant and appropriate requirements are those same standards mentioned above that while not "applicable" at the CERCLA site, address problems or situations sufficiently similar to those encountered at the site, and have a use well suited to the particular site.

Baseline Risk Assessment (BLRA): The qualitative and quantitative evaluation performed in an effort to define the risk posed to human health and/or the environment by the presence or the potential presence of specific pollutants.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA): A federal law passed in 1980 and modified in 1986 by the Superfund Amendments and Reauthorization Act (SARA). The Act created a Trust fund, known as Superfund, to investigate and clean up abandoned or uncontrolled hazardous waste sites.

Dense Non-Aqueous Phase Liquids (DNAPLs): Contaminants which do not readily dissolve in and are heavier than water. DNAPLs sink in the aquifer and act as a continuing source of groundwater contamination.

Ecological Risk Assessment (ERA): An evaluation performed to determine potential risk or harm to ecological resources from exposure to contaminants at a Superfund site.

Feasibility Study: Analysis of the practicability of the potential cleanup alternatives.

Groundwater: Water found beneath the earth's surface that fills pores between soil, sand, and gravel particles to the point of saturation. Ground water often flows more slowly than surface water. When it occurs in sufficient quantity, ground water can be used as a water supply.

Hazard Index (HI): The ratio between the average daily dose of a toxicant received by a human population and the reference dose. The reference dose is an average daily lifetime dose believed to be without adverse effects in human populations.

Hazard Ranking System (HRS): A mathematical ranking scheme that combines the potential of a release to cause hazardous situations with the severity/magnitude of these potential impacts and the number of people who may be affected.

Maximum Contaminant Levels (MCL): Standards for drinking water set by the Federal and State laws.

National Priorities List (NPL): EPA's list of the nation's top priority hazardous waste sites that are eligible to receive federal money for response actions under Superfund.

Parts per million (ppm): The concentration of a contaminant in the air or water presented as the ratio of volumes.

Parts per billion (ppb): A concentration of a contaminant in the air or water presented as the ratio of volumes.

Potentially Responsible Party (PRP): Those identified by EPA as potentially liable under CERCLA for cleanup costs. PRPs may include generators and present or former owners/operators of certain facilities or real property where hazardous wastes have been stored, treated, or disposed of, as well as those who accepted hazardous waste for transport and selected the facility.

Record of Decision (ROD): A legal document that describes the final remedial actions selected for a Superfund site, why the remedial actions were chosen over others, how much they will cost, and how the public responded to the Proposed Plan for cleanup at the Site.

Remedial Investigation (RI): An in-depth study designed to gather the data necessary to determine the nature and extent of contamination at a Superfund site; establish criteria for cleaning up the site; identify preliminary alternatives for remedial actions; and support the technical and cost analyses of the alternatives. The remedial investigation is usually done with the feasibility study. Together they are referred to as the "RI/FS."

Semi-Volatile Organic Compounds (SVOCs): Chemicals that tend not to vaporize at room temperature.

Superfund: The program operated under CERCLA and SARA that funds and carries out the EPA solid waste emergency and long-term remedial activities.

Volatile Organic Compound (VOC): Any organic compound which participates in atmospheric photochemical reactions for those organic compounds designated by the EPA Administrator as having negligible photochemical reactivity.